Claims

[c1] 1. A non-aqueous electrolyte secondary battery provided with a positive electrode capable of absorbing and desorbing lithium, a negative electrode capable of absorbing and desorbing lithium, and a non-aqueous electrolyte solution, wherein

a positive electrode active material in said positive electrode is a mixture of lithium-manganese composite oxide and at least one of lithium-nickel composite oxide represented by a general formula $LiNi_aM1_{1-a}O_2$ (wherein M1 denotes at least one element selected from B, Mg, Al, Ti, Mn, V, Fe, Co, Cu, Zn, Ga, Y, Zr, Nb, Mo, and In, and a relationship $0<a\leq 1$ is satisfied), and lithium-cobalt composite oxide represented by the general formula $LiCo_bM2_{1-b}O_2$ (wherein M2 denotes at least one element selected from B, Mg, Al, Ti, Mn, V, Fe, Ni, Cu, Zn, Ga, Y, Zr, Nb, Mo, and In, and the relationship 0<b_1 is satisfied), and

said non-aqueous electrolyte solution contains at least a saturated cyclic carbonic acid ester and an unsaturated cyclic carbonic acid ester having double bond of carbon where content by amount of said unsaturated cyclic carbonic acid ester having double bond of carbon is in a

range of 1.0×10^{-8} to 2.4×10^{-4} g per positive electrode capacity 1 mAh.

[c2] 2. The non-aqueous electrolyte secondary battery according to claim 1, wherein
said lithium-manganese composite oxide has a spinel-type crystal structure.

[c3] 3. The non-aqueous electrolyte secondary battery according to claim 2, wherein
said lithium-manganese composite oxide is represented by the general formula $Li_{1+e}Mn_{2-f}M4_fO_4$ (wherein M4 denotes at least one element selected from B, Mg, Al, Ti, Mn, V, Fe, Co, Ni, Cu, Zn, Ga, Y, Zr, Nb, Mo, In, and Cr, and the relationships $0 \leq e \leq 0.5$, and $0 \leq f \leq 1$ are satisfied).

[c4] 4. The non-aqueous electrolyte secondary battery according to claim 1, wherein
said lithium-nickel composite oxide is represented by the general formula $LiNi_cMn_dM3_{1-d}O_2$ (wherein M3 denotes at least one element selected from B, Mg, Al, Ti, V, Fe, Co, Cu, Zn, Ga, Y, Zr, Nb, Mo, and In, and the relationships $0 < c \leq 1$, and $0.1 < d$ are satisfied).

[c5] 5. The non-aqueous electrolyte secondary battery according to claim 4, wherein
M3 in said lithium-nickel composite oxide is at least one

element selected from Co, Al, Mg, and Cr.

[c6] 6. The non-aqueous electrolyte secondary battery according to claim 4, wherein
said lithium-nickel composite oxide is represented by the general formula $LiNi_cMn_dCo_{1-d}O_2$ (wherein the relationships $0<c<0.5$, $0.1<d<0.6$ are satisfied).

[c7] 7. The non-aqueous electrolyte secondary battery according to claim 1, wherein
said unsaturated cyclic carbonic acid ester having double bond of carbon is vinylene carbonate.

[c8] 8. The non-aqueous electrolyte secondary battery according to claim 1, wherein
said non-aqueous electrolyte solution contains a chain carbonic acid ester in addition to the saturated cyclic carbonic acid ester and the unsaturated cyclic carbonic acid ester.

[c9] 9. The non-aqueous electrolyte secondary battery according to claim 1, wherein
negative electrode active material in said negative electrode is graphite.

[c10] 10. The non-aqueous electrolyte secondary battery according to claim 1, wherein
the negative electrode active material in said negative

electrode is graphite coated with low crystalline carbon in which whole or a part of a surface of first graphite material as a substrate is coated with second carbon material which is lower in crystallinity compared with the first graphite material.

[c11] 11. The non-aqueous electrolyte secondary battery according to claim 10, wherein
said graphite coated with low crystalline carbon has an intensity ratio (IA/IB) which is an intensity IA of 1350/cm based on an intensity IB of 1580/cm, as measured by argon laser Raman, in a range of 0.2 to 0.3.